Claims

- [c1] 1. A method for producing a plant characterized by reversible male-sterility comprising transforming a plant cell with a nucleic acid construct containing a polynucleotide encoding a gai gene, a regulatory sequence, and transcription termination sequence and regenerating a plant from said plant cell wherein expression of said gai gene inhibits pollen formation in said plant. 2. The method of claim 1, wherein said regulatory sequence is selected from the [c2] group consisting of constitutive, inducible, environmentally regulated, developmentally regulated, organelle-specific, cell-specific, tissue-specific, male specific, anther-specific, pollen-specific, stamen-specific, tapetumspecific promoters and any combination thereof. 3. The method of claim 2, wherein said promoter is a pollen-specific promoter. [c3] 4. The method of claim 2, wherein said promoter is an anther-specific promoter. [c4] 5. A method for producing a plant characterized by reversible male-sterility [c5] comprising transforming a plant cell with a nucleic acid construct containing a polynucleotide encoding a gai gene, a regulatory sequence, and transcription termination sequence; regenerating a plant from said plant cell wherein expression of said gai gene inhibits pollen formation in said plant; and restoring male-fertility by application of a composition comprising cytokinin. [c6] 6. The method of claim 5, wherein said composition further comprises a surfactant. 7. The method of claim 5, wherein said cytokinin comprises kinetin. [c7] [c8] 8. The method of claim 7, wherein kinetin is applied at between about 1 mg/plant to about 50 mg/plant. [c9] 9. The method of claim 7, wherein kinetin is applied at between about 10
- mg/plant to about 15 mg/plant.
- [c10] 10. The method of claim 5, wherein said composition is applied prior to development of the male tissues.

[c11] 11. The method of claim 5, wherein said composition is applied during the development of male tissues.

[c12] 12. The method of claim 1, further comprising transforming said plant cell with a nucleic acid construct comprising an inducible promoter and a transcription termination sequence both operably linked to an antisense construct wherein expression of said antisense construct suppresses expression of said *gai* gene.

[c13] 13. A method for producing a plant characterized by reversible male—sterility comprising transforming a plant cell with a nucleic acid construct containing a polynucleotide encoding a gai gene, a regulatory sequence, and transcription termination sequence; regenerating a plant from said plant cell wherein expression of said gai gene inhibits pollen formation in said plant; sexually crossing said plant comprising said polynucleotide encoding a gai gene with a plant of the same variety comprising a nucleic acid construct containing an inducible promoter and a transcription termination sequence both operably linked to an antisense construct wherein expression of said antisense construct suppresses expression of said gai gene.

[c14] 14. The method of claim13, wherein male-fertility is restored by expression of said antisense construct.

[c15] 15. The method of claim 1, further comprising transforming said plant cell with a nucleic acid construct comprising an inducible promoter and a transcription termination sequence both operably linked to polynucleotide encoding a dominant negative mutant protein, wherein expression of said dominant negative mutant results in decreased expression or activity of said *gai* gene.

[c16]

16. The method of claim 1, further comprising sexually crossing said plant comprising said polynucleotide encoding a gai gene with a plant of the same variety comprising an inducible promoter and a transcription termination sequence both operably linked to polynucleotide encoding a dominant negative mutant protein, wherein expression of said dominant negative mutant results in decreased expression or activity of said gai

gene.

[c17] 17. The method of claim 16, wherein male-fertility is restored by expression of said dominant negative mutant protein.

[c18] 18. The method of claim 1, further comprising transforming said plant cell with a nucleic acid construct comprising an inducible promoter and a transcription termination sequence both operably linked to a polynucleotide encoding a ribozyme wherein expression of said ribozyme suppresses expression of said gai gene.

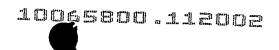
[c19] 19. A method for producing a plant characterized by reversible malesterility comprising transforming a plant cell with a nucleic acid construct containing a polynucleotide encoding a *gai* gene, a regulatory sequence, and transcription termination sequence; regenerating a plant from said plant cell wherein expression of said *gai* gene inhibits pollen formation in said plant; and sexually crossing said plant comprising said polynucleotide encoding a *gai* gene with a plant of the same variety comprising a nucleic acid construct containing an inducible promoter and a transcription termination sequence both operably linked to a polynucleotde encoding a ribozyme, wherein expression of said ribozyme suppresses expression of said *gai* gene.

[c20] 20. A method for producing a plant characterized by reversible male-sterility comprising transforming a plant cell with a nucleic acid construct containing a polynucleotide encoding a *gai* gene, a regulatory sequence, and transcription termination sequence; regenerating a plant from said plant cell wherein expression of said *gai* gene inhibits pollen formation in said plant; and selfing said plant to produce a plant homozygous for said polynucleotide encoding a *gai* gene.

- [c21] 21. A seed from a plant produced by the method of any of the preceding claims.
- [c22] 22. A uniform population of plants produced by the method of any of claims 1–20.

- 23. A method of producing a hybrid plant comprising sexually crossing a plant [c23] produced by the method of any of claims 1-22 with a plant of the same species having a different genetic makeup. 24. A hybrid plant produced by the method of claim 23. [c24] 25. A seed produced from the plant of claim 23. [c25] 26. A method for preventing or reducing the pollination of plants with pollen [c26] containing a transgene comprising: a) interplanting, 1) a transgenic, male-sterile plant containing, in addition to at least one transgene, a nucleic acid construct encoding a gai gene, wherein said malesterility is due to expression of said gai gene, and 2) a plant of the same or different variety as the plant in 1) that is not transgenic; and b) allowing the plants of 2) to pollinate the plants of 1). [c27] 27. The method of claim 1, wherein said gai gene is an anther-expressed gai gene. 28. The method of claim 1, wherein said male-sterility is reversible. [c28][c29] 29. The method of claim 28, wherein said reversibly male-sterile plant is produced by the method of any of claims 1-20. [c30]30. A method for preventing or reducing the pollination of plants with pollen containing a transgene comprising obtaining a plant hemizygous for a pollen expressed gai gene linked to at least one transgene wherein expression of said gai gene results in male sterility; and growing said plant. [c31] 31. The method of claim 30, wherein said plant is obtained by crossing a plant homozygous for said pollen-expressed gai gene linked to at least one transgene to a non-transgenic plant.
- [c32]

 32. A method for producing a grain or plants with an economically important transgenic or non-transgenic trait comprising interplanting (a) an agronomically



desirable plant wherein said plant has been made reversibly male-sterile by the method of any of claims 1-20, and (b) a plant possessing an economically desirable trait; and allowing the plants of (b) to pollinate the plants of (a).

- [c33] 33. The method of claim 32, wherein the plant of (a) is an elite hybrid variety.
- [c34] 34.The method of claim 32, wherein the plant of (b) is interplanted at a low density.
- [c35] 35.A transgenic corn plant comprising the *gai* gene.